

Pennsylvania's Standards Aligned System – Mathematics

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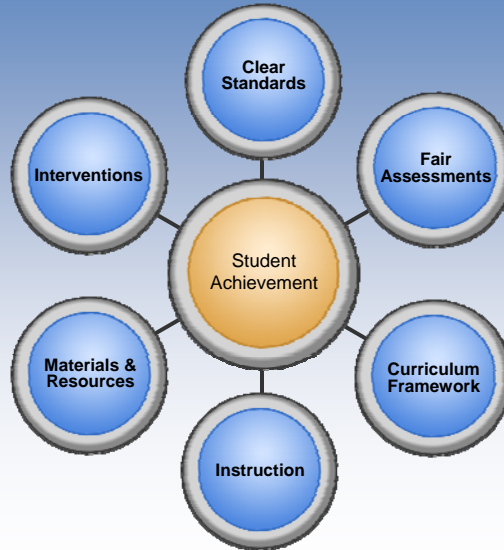
Math Network Meeting – IU 19
May 8, 2009

Agenda

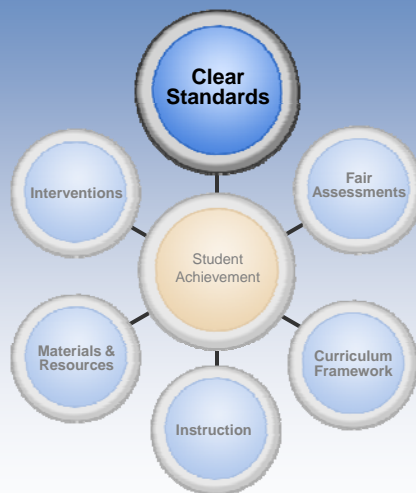


- To share the concept of a Standards Aligned System
- To explore the Curriculum Framework component
- To explore the current status of Standards Aligned System – Mathematics
- To answer your questions

Standards Aligned Systems



Standards Aligned Systems



Clear Standards

Clear, high standards that establish what all students need to know and be able to accomplish.

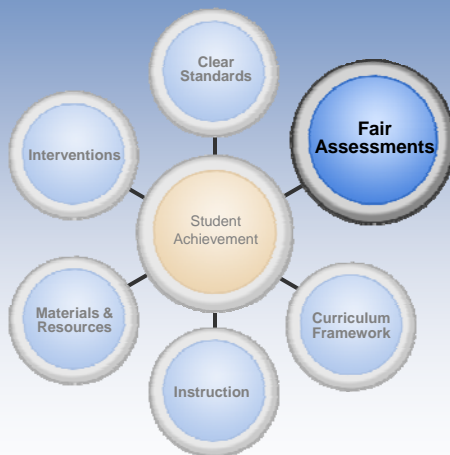
Revised Standards for grades 3, 5, 8 and 11 have been approved.

Standard statements for grades 4, 6, 7 and Algebra 1, Algebra 2 and Geometry are proceeding through the approval process.

Sample of Approved PA Math Standard

2.9 Geometry				
Strand	2.9.3. GRADE 3	2.9.5. GRADE 5	2.9.8. GRADE 8	2.9.11. GRADE 11
<i>Pennsylvania's public schools shall teach, challenge and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to:</i>				
A. Definitions, Properties and Relations	Name, describe and draw/build 2- and 3-dimensional shapes.	Identify, describe, and define 1-, 2-, and 3-dimensional shapes and their related parts, and classify and compare 2- and 3-dimensional shapes on the basis of their properties.	Name, describe and apply geometric relations for 1-dimensional shapes and 2-dimensional shapes and 3-dimensional solids.	Create justifications for arguments related to geometric relations.
B. Transformations and Symmetry	Identify and draw lines of symmetry .	Predict and describe the result of a translation (slide), rotation (turn), or reflection (flip) of a 2-dimensional shape.	Predict and describe the result of a translation (slide), rotation (turn), or reflection (flip) of a 3-dimensional shape.	Use arguments based on transformations to establish congruence or similarity of 2-dimensional shapes
C. Coordinate Geometry	Identify locations of points with whole number coordinates on a number line or on a 2-dimensional coordinate system .	Identify location of points with fractional or decimal coordinates on a number line or on a 2-dimensional coordinate system .	Plot ordered pairs and 2-dimensional shapes that satisfy given conditions on a 2-dimensional coordinate system .	Use techniques from coordinate geometry to establish properties of lines, shapes and solids.

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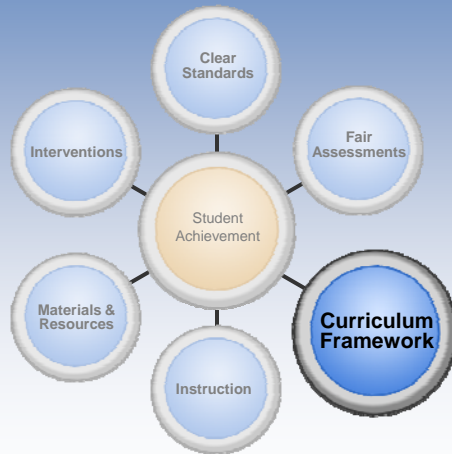
Fair Assessments

Fair assessments aligned to the standards.

Types of Assessment :

- Summative
- Formative
- Benchmark
- Diagnostic

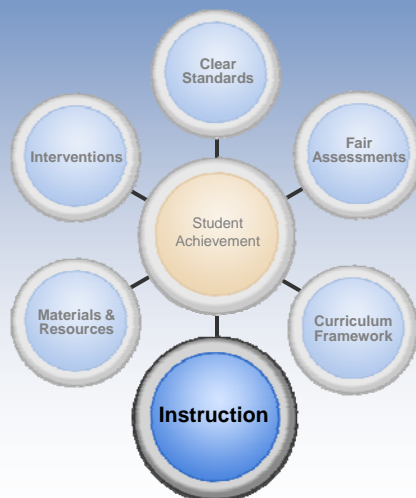
Standards Aligned Systems



Curriculum Framework

A framework specifying Standards, Big Ideas, Concepts, and Competencies, Essential Questions, Vocabulary, and Exemplars in each subject area at each grade/course level.

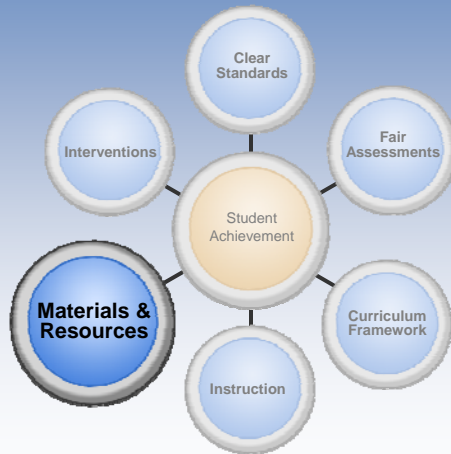
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Instruction

Aligning instruction with standards involves identifying strategies that are best suited to help students achieve the expected performance.

Standards Aligned Systems



Materials & Resources

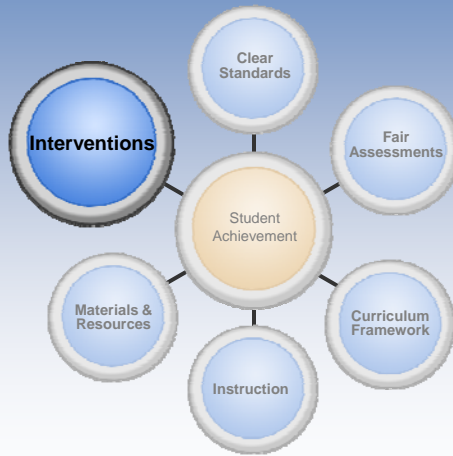
Materials that address the Standards and Curriculum Framework

- Units and Lesson Plans
- Multi-media resources

Materials and Resources RFP

- Diagnostic Assessments
- Resources and Materials aligned to the Curriculum Frameworks....
- Graduate Competency Exams
 - AKA End of Course Exams
 - AKA Keystone Exams

Standards Aligned Systems



Interventions

A safety net/intervention system that insures all students meet standards.

Curriculum Framework

- Standards
- Big Ideas
- Concepts
- Competencies
- Essential Questions
- Vocabulary
- Exemplars

Standards and Big Ideas

- Standards: State Board approved content goals for all students.
 - Includes anchor standards.
- Big Ideas: Declarative statements that describe concepts that transcend grade levels.
 - Essential to provide focus on specific content for all students.
 - *Serve as focal points of curricula and instruction*
 - *Building material of understandings* (McTighe & Wiggins, 2005)

Two Big Ideas

BIG IDEAS - Mathematics – K - Algebra 2	K	1	2	3	4	5	6	7	P A	A L 1	G E O	A L 2
The base-ten number system is a way to organize, represent and compare numbers using groups of ten and place value.	X	X	X	X								
Numbers, measures, expressions, equations and inequalities can represent mathematical situations and structures in many equivalent forms.	X	X	X	X	X	X	X	X	X	X	X	X

Concepts

- Concepts: Descriptions of what students should know based on PA standards. Concepts span grade levels.

Concept	Grades Addressed
Base 10 Number System	K, 1, 2, 3, 4
Division of numbers	3, 4, 5, 6

Competencies

- Competencies: Grade specific descriptions of what students should be able to do.
- Competencies provide focus for the entire year's instruction.

Competency	Grade
Decompose, as well as compose, two- and three-dimensional shapes, describing their properties in order to build understanding of part-whole relationships.	1
Write mathematical expressions and equations that correspond to given situations, evaluate expressions and use expressions and formulas to solve problems.	6

Example

Competencies – Mathematics – Grade 2

Represent, compare, and order whole numbers up to 1000, and their equivalents (e.g. 35 is 3 tens and 5 ones or two tens and 15 ones), including using the number line and expanded notation, while grouping in hundreds, tens and ones.

Develop extended understanding of multiple models, and properties of addition and subtraction, leading to fluency with efficient, accurate and generalizable methods to add and subtract multi-digit whole numbers and develop quick recall of addition and related subtraction facts. Select and apply appropriate methods to estimate sums and differences or to calculate them mentally.

Extend concepts and procedures for estimating and measuring length, area, volume, weight, time and elapsed time.

Use processes (e.g. partitioning, transitivity, inverse relationships) to estimate, measure, and compute lengths to solve problems involving data, space and movement, including standard measures such as centimeter and inch.

Use number patterns to extend knowledge of properties of numbers and operations (skip counting as a foundation for understanding multiples)

Essential Questions

- Essential Questions: Overarching questions connected to the SAS framework and are specifically linked to the big ideas. They frame student inquiry and promote critical thinking and assist in learning transfer.

Essential Questions	Grade
How can composing and decomposing shapes help us understand part-whole relationships?	1
How can we use mathematics to provide models that help us interpret data, make predictions, and better understand the world in which we live, and what are the limits of these models?	6

Vocabulary

- Vocabulary: Key terminology linked to the Standards, Big Ideas, Concepts and Competencies in a specific content area and grade/course level.
- The Vocabulary set has been aligned exactly with the PA Mathematics Standards Glossary

Exemplars

- Exemplars: performance tasks that can be used for assessment, instruction as well as professional development.
- Exemplars provide educators with a concrete examples of instructing and assessing students' understanding of the Big Ideas, Concepts and Competencies.

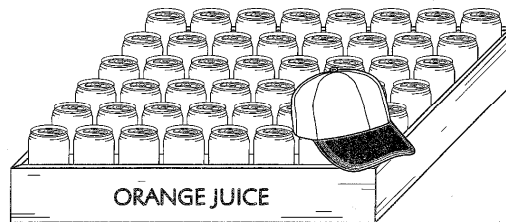
Mathematics – Grade 4 Exemplar

Number: Multiplication and Division:

This page has a picture of a case of juice cans, but the delivery person has left a baseball cap on top. How can we figure out how many cans of juice are in this case, including the ones that we can't see?

Source: *Investigations in Number, Data and Space*, Grade 4, Factors, Multiples and Arrays

How Many in This Array?



How many cans are in this case,
including those under the cap? _____

How did you figure this out?

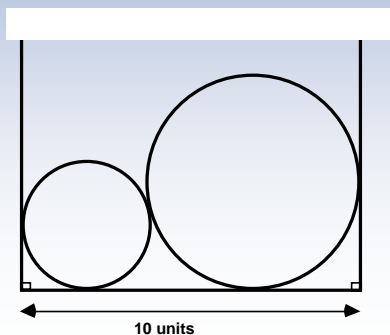
Mathematics – Algebra 2 Exemplars

Marbles in a Glass

Two marbles are sitting side by side in a glass container. The base of the container is 10 units in length, and the radius of the smaller marble is 2 units.

1. Describe a strategy that you could use to find the radius of the large marble.
2. Use this strategy to calculate the radius of the large marble.

Balanced Assessment in Mathematics Program - Assessment Task Alg 2 Exemplar - Marbles in a Glass, page 1 of 1;
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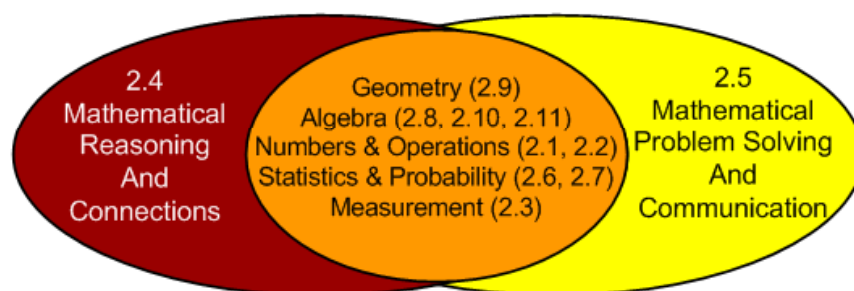


Let's take a look at SAS-Math

www.pde.state.pa.us/sas

What about Mathematics?

Mathematics



How is SAS-Math Organized?



Grade Bands → Mathematical Processes
 → Grade/course
 → Curriculum Framework

Sample Process Page

To search for a specific aligned standard, please select the appropriate Subject, Content Area/Grade Band and Grade/Course from the drop-downs below.

Select a Subject:
 Mathematics

Select a Grade Band:
 3-5

Mathematical Processes - Grade 3 Through Grade 5

The mathematical processes consist of the mathematical competencies that embody the "doing" of mathematics. These processes should form the core of the activities that are engaged in the mathematics classroom and should provide focus and purpose for the entire mathematics experience of all students in the Commonwealth.

PA Standard	Process	Grade Band Description
2.5 Mathematical Problem Solving and Communication	Problem Solving	Problem solving in grades 3 through 5 should not be a distinct topic; rather, it is a process that should permeate the study of mathematics and provide a context in which concepts and skills are learned.
	Communication	Communication in grades 3 through 5 should focus on using communication as a tool for understanding and generating solution strategies. In addition, students should become more adept at learning from, and working with, others.
	Representation	Representation in grades 3 through 5 should focus on modeling problem situations, investigating mathematical relationships, and justifying or disproving conjectures. Students should use informal representations, such as drawings, to highlight various features of problems; they should use physical models to represent and understand ideas such as multiplication and place value. They should also learn to use equations, charts, and graphs to model and solve problems.
2.4 Mathematical Reasoning and Connections	Reasoning and Proof	Reasoning in grades 3 through 5 should focus on formulating conjectures and assessing them on the basis of evidence. Students should learn that by considering a range of examples, they can reason about the general properties and relationships they find.
	Connections	Connections in grades 3 through 5 should focus on equivalence and structures and applications of multiplication. These two concepts connect much of the mathematics developed in these grades.

Select a Grade/Course:
 Select a Grade/Course

Curriculum Framework Example

Select a Grade/Course:
4

Standard(s) Aligned System
Subject: Math
Grade: 4

Last Modified Date:
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Clear Standards Fair Assessments **Curriculum Framework** Instruction Materials and Resources Interventions

- Big Ideas
- Concepts
- Competencies
- Essential Questions
- Vocabulary
- Exemplars

Where to start???

Begin with the Competencies!

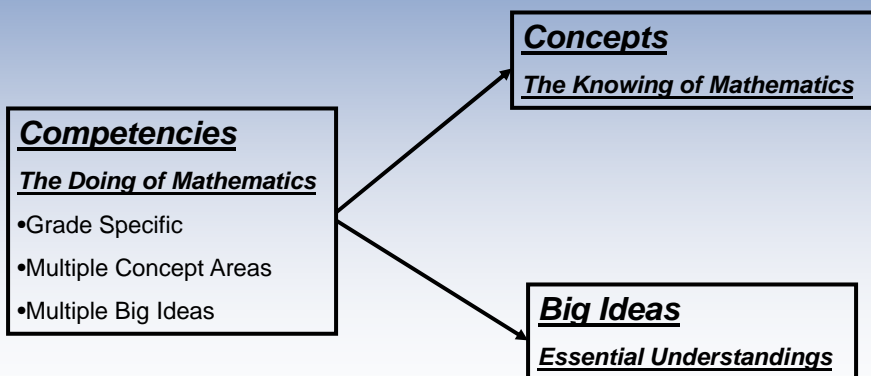
- They provide the overall focus and target for the entire year's mathematics instruction...
- Brainstorm on *what must be learned in order for all students to demonstrate each competency at the end of the year...*
- Analyze current text and resources to determine whether they support the grade/course level competencies...

1st Grade Competencies

Competencies

Competencies - Mathematics - Grade 1	Pennsylvania Mathematics Standards									
	2.5					2.8	2.6	2.9	2.3	2.1
	2.4					2.10	2.7			2.2
						2.11	DA/P	Geo	Meas	N/O
	PS	Com	Rep	Reas	Con	Alg	DA/P	Geo	Meas	N/O
Represent, compare, and order whole numbers up to 100, including using the number line and grouping in tens and ones.			X	X	X	X				X
Use properties (commutative, associative) and a variety of models to develop understanding of two digit addition and subtraction, and the relationship between them, as well as develop strategies for basic addition facts and related subtraction facts.		X	X	X	X	X				X
Use standard and non-standard units of measurement to find lengths and subsequently solve problems.	X	X	X	X	X				X	
Decompose, as well as compose, two- and three- dimensional shapes, describing their properties in order to build understanding of part-whole relationships.		X	X	X	X			X		
Apply, as well as identify and describe number patterns and properties such as odd and even.	X	X	X	X	X	X				X
Represent measurements and discrete data in picture and bar graphs involving counting and comparing. These should provide meaningful connections to number relationships.		X	X	X	X		X			X

The Relationship...



Discussion Groups

- What does SAS-Math mean to regular education math teachers?
- How best should regular education teachers use SAS-Math?

Possible Answers TEACHERS

- Helps to focus content and instruction on critical understandings
- Provides targets for curriculum revision
- Provides resources for program selection/selection of supplemental materials
- Provides a framework and resource for collaborative discussions on curriculum, instruction and assessment

Discussion Groups

- What does SAS-Math mean to administrators?
- How best should administrators use SAS-Math?

Possible Answers ADMINISTRATORS

- A tool to lay the foundation for Rtl, school improvement, and general improvements of infrastructure
- Provides a framework for improved teacher supervision
- Provides a guide and resource to help guide ongoing professional development of staff at all levels

Discussion Groups

- What does SAS-Math mean to special education teachers?
- How best should special education teachers use SAS-Math?

Possible Answers SPECIAL EDUCATION TEACHERS

- Helps to prioritize need (e.g., a child is 4 grade levels behind-SAS helps determine where to start with remediation)
- Teacher has access to the truly important math in multiple grade levels, which allows them to get a big picture of what's really important for a student who is deficient
- Helps to write standards-aligned IEPs
- Knowledge of big ideas and major concepts help to predict the types of support that will be needed for both the student and staff
- Provides a tool that will help determine appropriate interventions (info on interventions in conjunction with info on major concepts and competencies)

Standards Aligned System -
Mathematics

Questions?